



Hold That Water

★ TEKS

Science - Ch112

Grades	3-6	K.1	K.2	K.4	K.5	K.10	1.1	1.2	1.4	1.5	1.10	2.1	2.2	2.4	2.5	2.10
Duration	60-90min	3.1	3.2	3.4	3.5	3.11	4.1	4.2	4.4	4.5	4.11	5.1	5.2	5.4	5.5	5.12
Setting	Classroom	...														

Focus Distinguish the properties of the 3 primary geological elements: soil, rocks and minerals.

➡ Read side 2 for Background.

Objective The student's task is to compare the time it takes for water to pass through pebbles, sand and clay soil.

- Procedure**
- Working in pairs, have the students use a pointed pencil to push 10 small holes into the bottom of three paper cups.
 - Have the students create 3 filters (one for each perforated cup) by tracing the cup's bottom onto the filter paper, then cutting out the circles.
 - Have the students place one filter in the bottom of each cup. Then they can fill the first cup halfway with pebbles; the second cup halfway with sand; and the third cup halfway with clay soil.
 - Have the students place three empty, intact cups on their workspace and place two wooden sticks parallel across the top of each. Place one soil-filled cup on the wooden sticks, above each empty cup.
 - Have the students record their predictions in their journals:
 - Which soil will allow water to pass through the fastest?
 - Which soil will the water pass through the slowest?
 - Add 50ml (1.5oz.) of water to the measuring cup. Make sure each partner is ready to begin. When both partners are ready, the person timing can say "Go". The person pouring should carefully add water to the first soil-filled cup from the measuring cup.
 - When the first drop of water falls into the empty cup below, the person pouring can say "Now". The timing partner should record how much time has elapsed.
 - Refill the measuring cup and repeat steps 6 & 7, on the other soil-filled cups. Have the students graph their results, and record the outcomes in their journal. Discuss.

Materials

- 6 paper cups
- 1 measuring cup
- 1 Journal page
- 1 piece of filter paper
- 1 bag of pebbles
- 1 bag of sand
- 1 bag of clay soil
- 6 wooden sticks
- scissors
- newspaper
- time piece showing seconds
- water
- pencil



Did You Know?

English scientist, Charles Darwin, studied earthworms and their effect upon soil. He once calculated that worms create between 10 and 15 tons of nutrient rich castings per acre.

➡ Read side 2 for Background.



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Background

Minerals form rocks—the building blocks of the planet. Rocks, minerals and organic matter break down to form soil, which provides nutrients to plants, allowing them to turn the sun's energy into chemical energy through the process of **photosynthesis**. Humans take in that energy and nutrients by eating fruits and vegetables.

The Stuff of Soil: Two of the most important ingredients of soil are called silt or sand. Although soil is mostly made up of tiny rock fragments, it also contains decayed plant and animal material (called **humus**), such as rotten leaves and decomposed insects and animal bodies. This rich material provides the nutrients that plants need to grow.

Through their roots plants absorb the minerals and nutrients in the soil. These elements power the plants physical growth and are detectable in the plant's tissues: fruits, leaves, stems, stalks, flowers, etc.

Did you ever wonder where water goes after it rains or snows? The ground absorbs most of the water from light rains and melting snow. The ground is said to be **permeable** if it allows water to pass through it. The amount of water that can pass through soil depends on the size and kind of particles in the soil.

Why do puddles of water form on top of soil during a downpour? As water flows through the ground, some of the water fills the air spaces between the particles of soil and rocks. As the air spaces fill with water, less water is able to pass through the soil and the water begins to back up. When all the air spaces are full the ground is considered **saturated**. The extra water begins to pool on top of the ground, and will eventually begin to flow.

Much of the erosion that takes place on the Earth's surface is caused by **runoff** (water that does not evaporate or get absorbed by the soil). Runoff makes up the streams and rivers that flow all year long, as well as those that form temporarily from a heavy rain or thawing snow or ice.

This activity explores the permeability and saturation point of three different kinds of soil.

The Make-Up of Minerals: Although not all geologists agree on the exact definition of a mineral, most do agree that a substance must fit these four criteria to be called a mineral:

- **Lifeless Lumps**—Minerals are **inorganic**, which means they do not form from the remains of plants, animals, or other living things. Some minerals form as magma cools or as a liquid solution evaporates. Others form as one mineral changes into another, such as when increasing pressure changes graphite into a diamond.
- **Naturally Occurring Stuff**—Minerals are solid substances that occur naturally in the Earth. Although scientists have learned how to make some minerals, such as diamonds,

most geologists use the term “mineral” to mean a naturally occurring substance formed in the Earth.

- **The Same, Through and Through**—Minerals have the same chemical make-up wherever they are found. For example, the mineral quartz always consists of one part silicon (an element) to two parts oxygen (another element). Some minerals, such as gold, copper and sulphur, are made up of just that element. But most minerals are combinations of several different elements.
- **Repeating Patterns**—The atoms that make-up elements of a mineral are bonded together in specific repeating patterns. This orderly arrangement of atoms is what forms a mineral's characteristic crystal shape. But sometimes, depending on how a mineral grows, the **symmetrical** pattern on the inside does not show up on the outside. The size of a crystal depends on how long it was growing and how much space was available.

What Makes a Rock: Geologists define rocks as substances that are made up of one or more minerals. For example, granite is a rock made up of the minerals quartz, feldspar, mica, and sometimes hornblende. And basalt is a rock made up of the minerals plagioclase and pyroxene. Most rocks are made up of several major minerals, as well as a few minor ones. But most rocks are made up of mostly one kind of mineral. For example, limestone, is made up mostly of the mineral calcite.

Rocks are the building blocks of the Earth. They make up the crust, the mantle, and the core. But unlike minerals, rocks are not the same through and through. For example, granite does not always contain the same proportions of quartz, mica, feldspar and hornblende. In addition, the size of the mineral crystals may vary. And because of this, different granites can look different and have different physical properties.



Did You Know?

It takes about 500 years for one inch of topsoil to form. Researchers have found that some soils in India, Africa and Australia are more than 2million years old.

Bibliography & Sources

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